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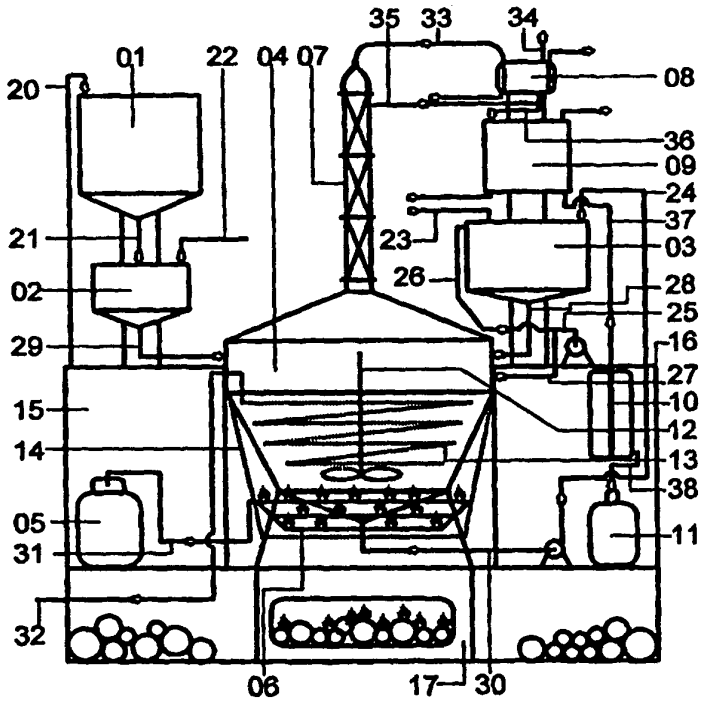
(54) Title: MULTIFUNCTIONAL AND COMPACT DEVICE FOR THE PRODUCTION OF DISTILLATES IN GENERAL WITH EMPHASIS ON AGUARDIENTE PRODUCTION

(57) Abstract

This invention refers to a multifunctional and compact device for the production of distillates in general, where in all the sequential process steps related to the aguardiente production are carried out in only one simple system of easy operation and with small proportion, when compared to the conventional systems normally used nowadays. The related equipment has the versatility to work with different types of raw materials, as well as the capacity of being designed for different production scales. Another distinguishing mark of such equipment relies on its capability of being operated with bottled GLP, as well as steam, wood, sugarcane bagasse, and/or electric heaters as heating source.



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# "MULTIFUNCTIONAL AND COMPACT DEVICE FOR THE PRODUCTION OF DISTILLATES IN GENERAL WITH EMPHASIS ON AGUARDENTE PRODUCTION"

The present proposition requests a Patent for a compact and versatile equipment with multiple functions, for the production of distillates in general, with emphasis on aguardente production, characterized by its capacity of carry out the many process steps of distillate production in just only one system of easy operation and handling.

The equipment provides to users all the steps for preparing the wort, medium fermentation, fermented broth distillation, as well as the final product correction just in only one system wich occupyies less room than the conventional systems but, however, still using all the necessary techniques for the making and obtaining a final distillate of high quality. Due to that, the referred equipment guarantees the access to such a millenary process to a great number of users, however, using the nowadays techniques, and also providing more practicity, efficiency, productivity, as well as quality.

The versality of the actual equipment leads to the utilization of many different types of raw material for aguardente production, as, for example, sugarcane juice, corn syrup, molasses, high test molasses, etc... , as well as those raw materials related to distillates prepared from

barley extracts, cereal extracts, and also those distillates prepared from wine.

As already known by the technicians involved in the state of art of distillates production, in a general manner the fermentation and distillation processes are normally carried out at different vessels, that is, the fermentation reactor for the fermented broth preparation, and the distillation column for broth distilling, and aguardente production, respectivelly. Differently from these conventional systems, the related equipment, subject of this patent request, is characterized by perform the steps of fermentation and distillation in a sequencial and logical manner just in only one single vessel that presents multifunctional properties; acting during certain period of time as a single batch fermenter and, lately, after fermentation is finished, as a distillation system. As a remark, the related equipment can also be used as grinder and also as an infusion device for those raw materials derived from starch wich need to be malted. Therefore, the related equipment suplies more facilities for those users who dispose of less available area for implantation of similar systems, basically due to its versatility, efficiency, and be compact.

In addition, the referred equipment can utilize several different sources of heat, like, for example, wood, sugarcane bagasse, electric energy, steam, and/or GLP. The use of bottled GLP as heat source during the distillation step gives more easyness to the operation of th distillation process, available area reduction, as w ll as discharges th

inconvenience of using the most common and actual heat sources, like wood and sugarcane bagasse, through direct burning, wich is known to be very difficult to keep the temperature control of distillation under the desired parameters, obviously leading to final products of low quality. For steam use, a boiler becomes necessary wich leads to investments raising. Direct electric energy also is considered nowadays to be an expensive source of heat. Due to the discussed above, the related equipment can be easily operated with GLP as cheap heat source for the distillation step, however, any of the sources above could be employed as it will be shown later.

Another remarkable characteristic of the related equipment relies on the possibility of change its production capacity, that is, it can be designed in many different scales, obviously altering it's overall size, as it will be discussed later.

Considering the drawings attached to this patent request, Figure 01 presents a frontal view of the equipment; Figure 02 is a up view of Figure 01; Figure 03 presents a detailed drawing of the fermentation/distillation vessel (4), showing the pieces numbers (41), and (42), wich form together the related vessel. Piece number (14) functions as heat insulator, piece number (06) is a GLP burner, and piece (43) is the sustaining base for the vessel. Finally, Figure 04 presents a detailed drawing for the wine distillation column, detaching the items (39), a copper plate, and (40), a Bell ceramic ring pack.

According to Figure 01, any of the raw material especified previously (glucose syrup, molasses, high test molasses, sugarcane juice...) is added into the stock tank (1) through line (20). From the stock tank, the related raw material is sent to the dillution tank (2) through line (21), where it receives dillution water through line (22) for correction of the sugar concentration, making it compatible with the fermentation needs.

Water and yeast, both qualified for fermentation, are added into tank (3) for the inoculum preparation, through lines (23) and (24), respectivelly, in such a way that a perfect adjustment of the yeast concentration for fermentation start-up is achieved, as well as in order to guarantee a fixed volume for the inoculum. Tank (3) is endowed with the aeration coil (19), wich is represented in Figure 02 to be fed by line (26) wich, by its turn, is a branch of line (25) that comes from the air source. The prepared inoculum is then sent to a vessel specially designed (4), named here as fermentation/distillation vessel, through line (28).

After inoculation, a predefined volume of wort is added to the fermentation/distillation vessel (4), through line (29), where fermentation begins.

While filling up the fermentation/distillation vessel, and also during fermentation, the medium is kept homogeneous, by means of a continuous electric agitator (12), at a fixed angular velocity. The agitator also serves to promote gas releasing from the fermentation medium,

enhancing efficiency and productivity. The medium temperature is controlled by a cooling coil (13). The control of aeration and cooling can be performed through automatization.

At the end of fermentation, wich is characterized by the total exhaustion of the fermentable sugars in the medium, the fermented broth is kept under rest (agitation and aeration turned off), and yeast begin to settle. Then, settled yeast is purged by the bottom of the fermentation/distillation vessel (4), through line (30), and pumped through line (24) into the yeast treatment tank (3) where the yeast cells suffer an adequate treatment, previously to the next fermentation batch.

The fermented broth still inside the fermentation/distillation vessel (4), free of yeast cells, will suffer the distillation step in order to produce the final distillate (aguardente or similar).

The distillation process starts by heating the fermentation/distillation vessel (4), by means of a direct flame heating device, fed by from bottled GLP (5), as for example a GLP burner (6), through line (31). In the case of heating by using wood or sugarcane bagasse as heat source, flame is produced on the furnace (17). In case of using steam as heat source, broth heating will be performed through the cooling coil (13), and line (32). For electric heating, a resistance can be used on the fermentation/distillation vessel. The insulator cover (14) minizes heat losses to the external ambient. The internal temperature value of the fermentation/distillation vessel (4) can be controlled by

means of an automatic system wich regulates the GLP flow rate and, consequently, flame intensity and heating capacity during broth distillation, keeping the temperature values at the optimum ranges. The automation can also be used for steam and electric resistance heating. Heating using wood or bagasse becomes more difficult to be controlled.

The gaseous mixture evolved on the fermentation/distillation vessel during distillation, that contains all the products that must be recovered (ethanol, aldehydes, esters, ... ) as distillate, goes up to the distillation packed column (7) where the gas/liquid separation process begins to occur. The gaseous mixture (distillate), almost at the desired final concentration, flows directly into the top reflux condenser (8), wich is basically a heat exchange device. At this condenser, the gaseous mixture passes by a cooling process, and all the undesirable volatile compounds are degassed through line (34). Part of the cooled mixture is continuously refluxed into the top of the distillation column (7), through line (35), while another part of the mixture is derived to another cooling vessel (9), through line (36), where the raw aguardente (or similar) is obtained at ambient temperature, in liquid phase.

The raw aguardente is then sent through line (37) to a polishing system (Filter, ionic exchange column, ... ) (10), and, finally, the pure distillate is obtained, and sent to the stock vessel (11) through line (38).

The referred equipment, subject of this patent request, presents a pair of benches attached to it (15) and (16), destinated to analytical

control, washing of analytical equipment, as well as to fit the GLP bottle in case of using GLP as heat source. All the items mentioned before guarantee such system to be compact, practical, and modern. In addition, Figure 03 shows a detail of the support plate for the referred equipment, and is designated as piece number (43).

As already mentioned previously, the referred equipment can be designed for different production capacities, and, below, the dimension ranges for the fermentation/distillation vessel (4) scalling are presented, considering that the peripherical devices follow the specified ranges by the same proportionality. According to Figure 03, we can verify that the fermentation/distillation vessel (4) is basically composed by pieces (41) and (42). Then :

A - Dimension range for piece (41) :

As in Figure 03, piece (41) presents a top flanged oppening to be connected to the packed distillation column (7). This top oppening varies in the range of 50 to 400 mm of diameter, following the distillation column diameter, while at the bottom, wich is connected to the top of piece (42), the diameter range is from 300 up to 5,000 mm. The height of the half superior cone-shaped structure, as well as its similar inferior part, can vary in the range of 100 to 700 mm.

B - Dimension range for piece (42) :

Piece (42), as already explained before, is connected to the bottom of piece (41) by its top, and presents a diameter range of 300 to

5,000 mm. The central conic structure varies in the range of 200 to 2,000 mm, and the height for the related structure varies in the range of 50 to 1,000 mm. Finally, the height of the inferior conic structure varies in the range of 20 to 500 mm.

Considering the dimension ranges shown above for the fermentation/distillation vessel (4), as well as the proportional adjustment of its peripherical auxiliar devices, it can be expected that the capacity production for the referred equipment follows the range of 01 to 5,000 liters of aguardente per batch, or, keeping the proportionality for the ethanol ratio, any other type of distillate. This way, the variation for the production capacity of the referred equipment is expected to be demonstrated.

## CLAIMS

1. Compact and multifunctional quipment, for distillate production in general, with emphasis on aguardente production, characterized by carry out the steps of wort preparing, fermentation, and fermented broth distillation, in the respective sequence, at just only one vessel.

2. Equipment as, according to claim 1, is characterized by its versatility on the processing of distillates derived from different raw materials, including those derived from starch.

3. Equipment as, according to claims 1, and 2, is characterized by its use as cereal grinding vessel previously to malting processes.

4.Equipment as, according to claims 1, and 2, is characterized by its use as infusion vessel for malting processes.

5.Equipment as, according to claims 1, 2, 3, and 4, characterized by its availability to the use of bottled GLP, and GLP burners as heating source.

6. Equipment as, according to claims 1, 2, 3, and 4, charcterized by its availability to the use of an electric resistance as heating source.

7. Equipment as, according to claims 1, 2, 3, and 4, characterized by its availability to the use of steam, and a steam coil, as heating source.

8. Equipment as, according to claims 1, 2, 3, and 4, characterized by its availability to the use of wood and/or sugarcane bagasse as heating source, with the aid of an adequate furnace adapted to it.

9. Equipm nt as, according to claims 1, 2, 3, 4, 5, 6, and 7, characterized by its possibility to be or not controlled by any automation devices. In case of automation, some process variables such as fermentation temperature can be controlled by sensor devices located at the fermentation/distillation vessel (4) wich, by their turn, drives the cooling water flow rate through the cooling coil (13), by means of a flow control valve. Similarly, the distillation step can also be controlled by adding temperature sensors at the distillation column (7). These sensors could be linked to a GLP flow control valve that adjusts flame intensity at the burner. In addition to this type of control, a device for GLP automatic ignition can also be used. For the case of using electric resistance, the temperature sensors located at the distillation column (7) would send an electric signal to a GLP valve controller device. Similarly, the same type of control systems discussed above could be used for steam as heat source, but the main control device would be a steam flow control valve located at the cooling coil (13), acting in this case as a heating coil. Also, an automatic control for grinding can be used in the same manner as above, but adding some other control devices for aeration flux and water level, being both parameters controlled by a timer device. Also, the control of time and temperature for malting infusion can be performed by a tempertaure sensor located at the fermentation/distillation vessel (4), and by a timer device, respectivelly. Condenser degassing of the undesirable volatile

compounds of bad flavour can be performed by a temperature sensor located at the top condenser (8) and a water flow control valve, keeping the condenser temperature at the optimum value for the recovering of high quality distillates. An automatic control at condenser (9), by means of temperature sensors and flow control valve may also be employed. For the misture refluxing from condenser (8) to the top of the distillation column (7), an automatic densimeter could be employed, in order to keep the alchoolic concentration at the desired range, also by means of a mixture flow control valve located at line (36), that is, after setting up the desired alcohol concentration at the outlet of the referred condenser, the refluxing rate would change automatically, accoording with this set point. At the end of the distillation process, when the desired alcohol concentration of the final distillate can not be reached by any means, the referred densimeter would send an electric signal to a burner controller wich, by its turn, would stop the heating process, consequently, the distillation step.

10. Equipment as, according to claim (9), is characterized by its availability of having or not automatic controls for total dissolved solids in the feed (Brix concentration in the feed), and for feed flow rate, respectivelly. In case of the use of such controls the operational aspects could be enhanced, this providing higher process overall efficiency as well as final distillates of high quality.

FIGURE 01

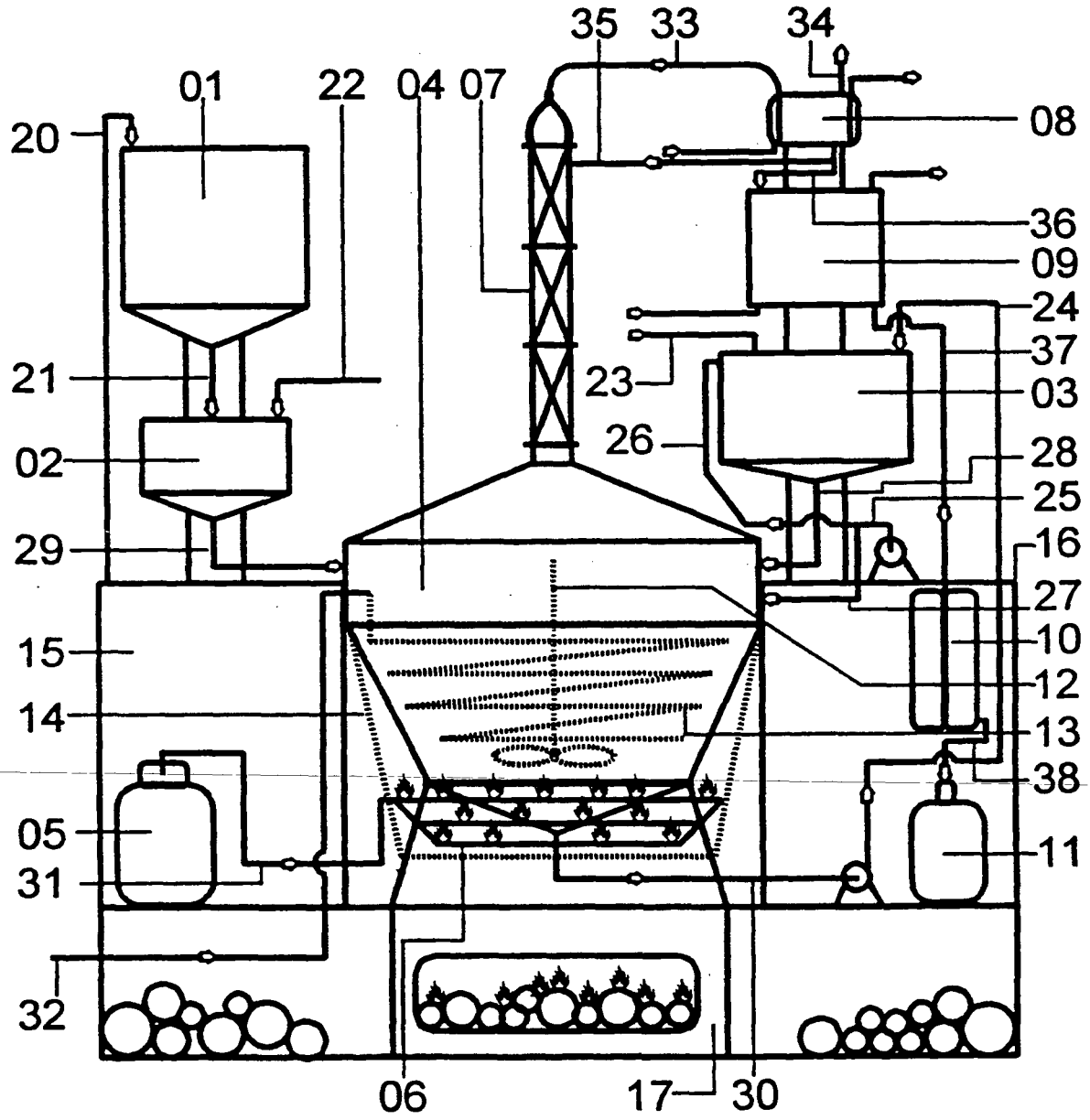


FIGURE 02

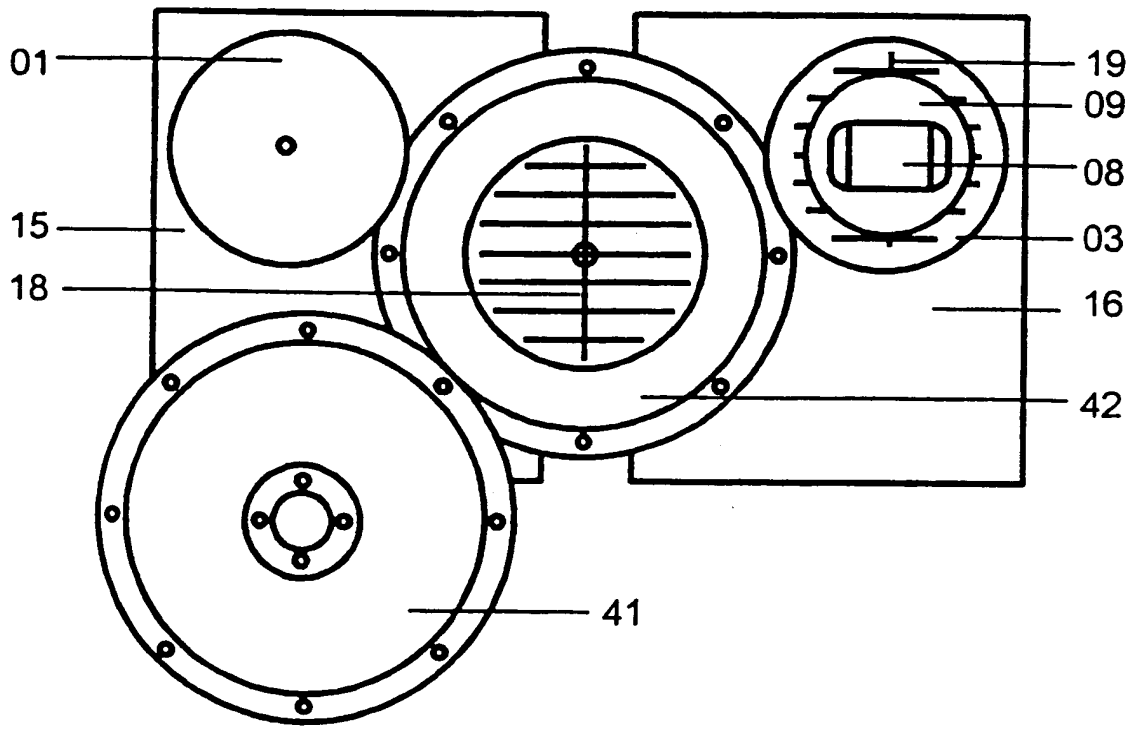


FIGURE 03

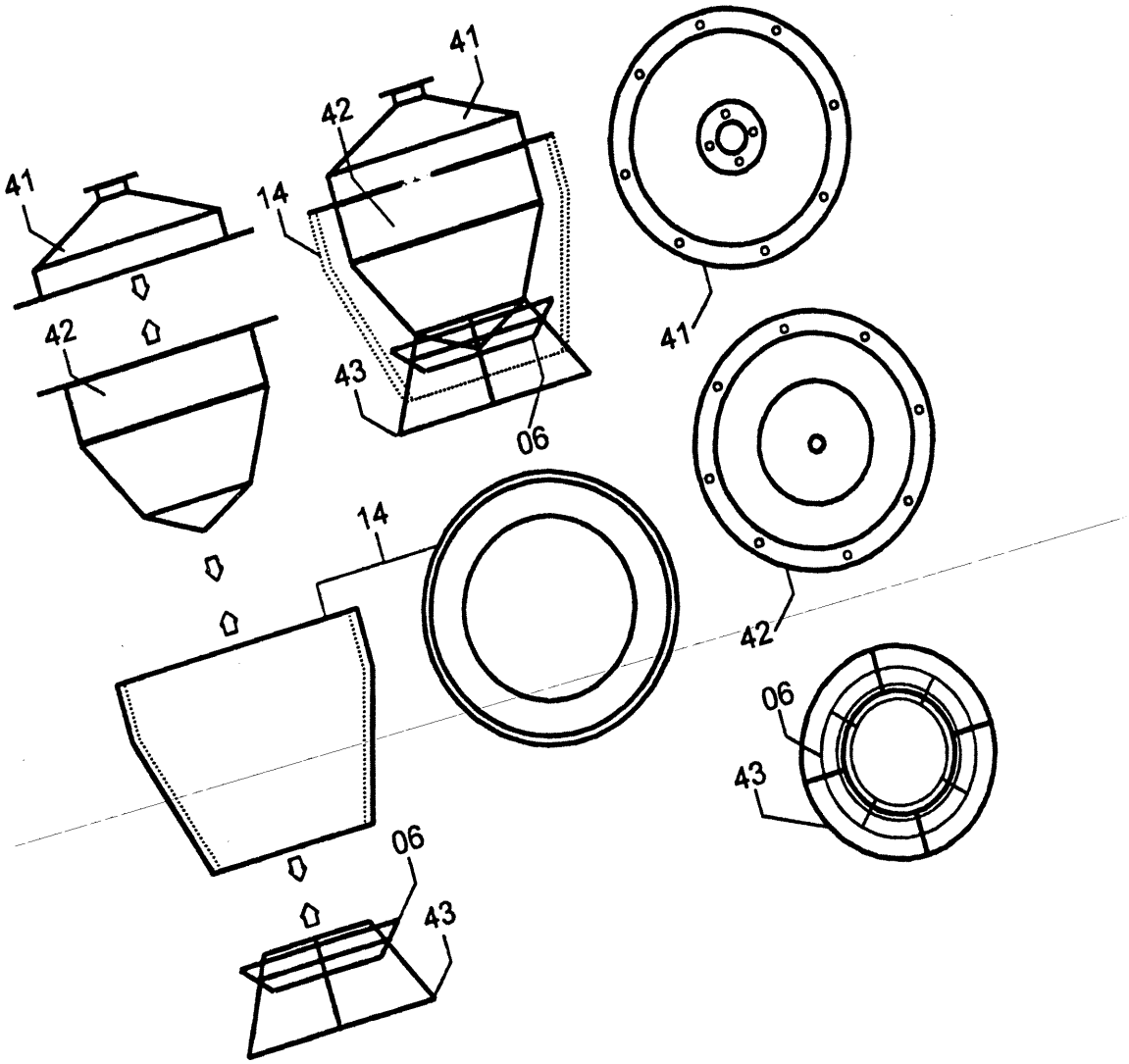
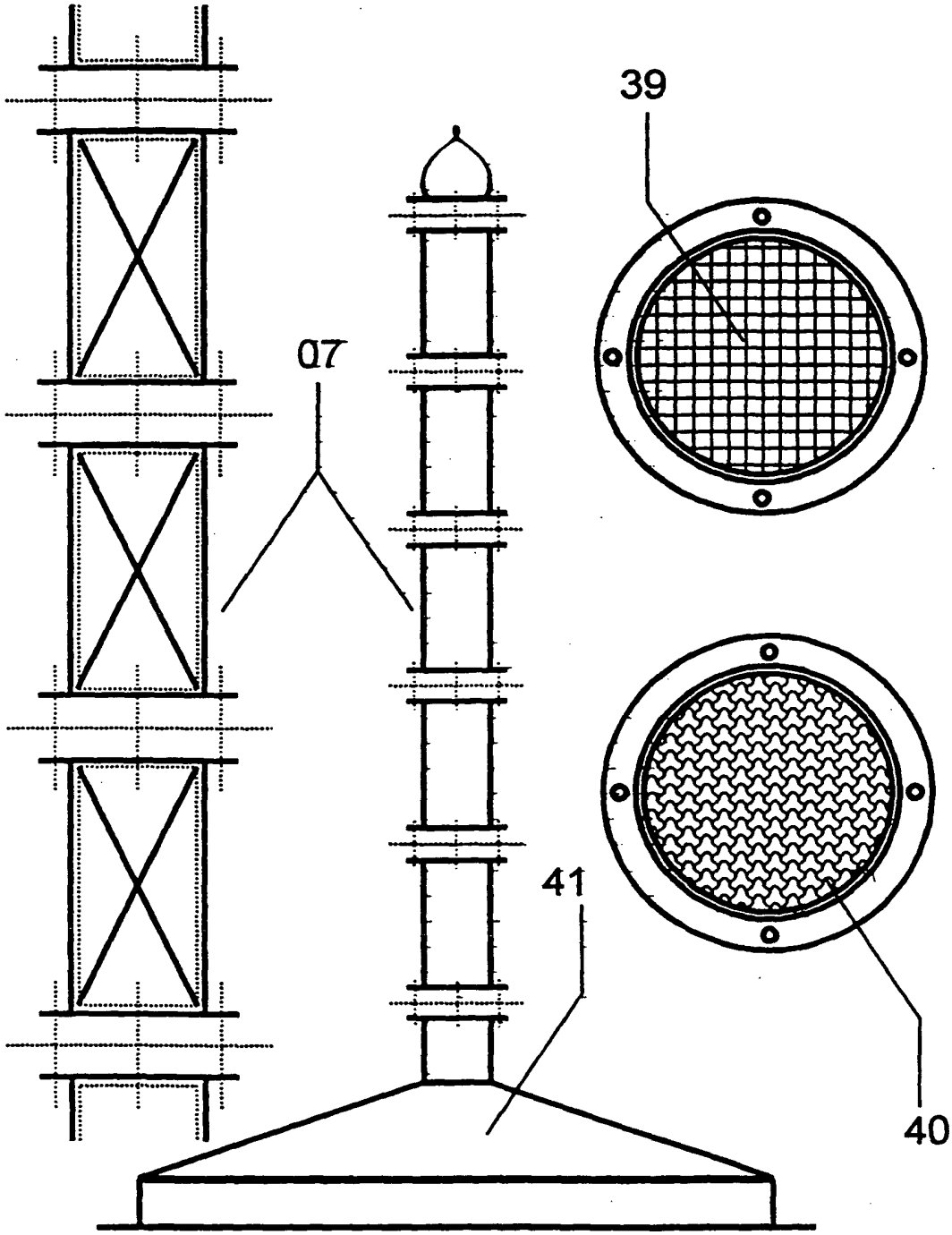


FIGURE 04



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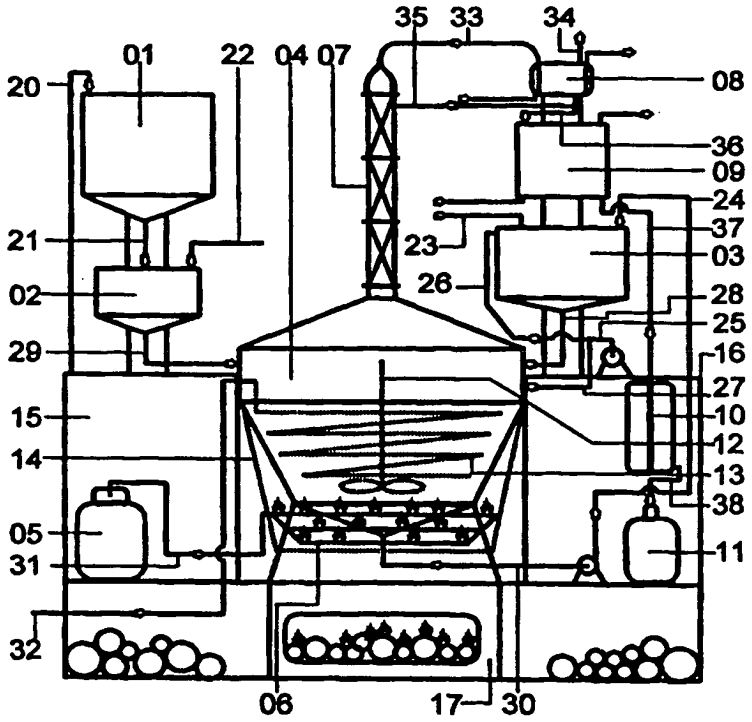

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# INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
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Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X<br>Y | US 4 347 321 A (LIONELLE JOSEPH E ET AL)<br>31 August 1982 (1982-08-31)<br>the whole document<br>--- | 1-8<br>9,10 |
| Y | FR 2 695 137 A (POINSARD ROBERT ;BORG BEATRICE) 4 March 1994 (1994-03-04)<br>page 1, line 23 - line 27<br>page 2, line 39 - page 3, line 15<br>--- | 9,10 |
| X | US 3 864 214 A (OHAKAS EVALD)<br>4 February 1975 (1975-02-04)<br>column 1, line 50 - line 65; claim 1<br>column 3, line 1 - line 51<br>--- | 1-8 |
| A | US 4 359 533 A (WILKE CHARLES R ET AL)<br>16 November 1982 (1982-11-16)<br>column 3, line 35 - line 44; claim 1<br>column 5, line 24 - column 7, line 57<br>---<br>-/-- | 1-8 |

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|---|---|---|
| A | US 3 969 537 A (STOLTENBURG HANS-MARTIN)<br>13 July 1976 (1976-07-13)<br>column 1, line 47 - line 50<br>column 2, line 49 - line 56<br>column 4, line 64 - column 5, line 4<br>--- | 1,9,10 |
| A | WO 89 01522 A (TECHNIPETROL SPA)<br>23 February 1989 (1989-02-23)<br>page 5, line 13 - page 6, line 4<br>page 7, line 31 - page 8, line 5<br>page 8, line 22 - line 26<br>page 9, line 12 - line 14<br>page 10, line 1 - line 4<br>page 11, line 30 - page 12, line 2<br>----- | 1,9,10 |

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# INTERNATIONAL SEARCH REPORT

'ormation on patent family members

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| Patent document cited in search report | | Publication date | Patent family member(s) | | Publication date |
|---|---|---|---|---|---|
| US 4347321 | A | 31-08-1982 | NONE | | |
| FR 2695137 | A | 04-03-1994 | NONE | | |
| US 3864214 | A | 04-02-1975 | NONE | | |
| US 4359533 | A | 16-11-1982 | NONE | | |
| US 3969537 | A | 13-07-1976 | DE | 2318751 A | 07-11-1974 |
| | | | CA | 1011156 A | 31-05-1977 |
| | | | DK | 136692 B | 14-11-1977 |
| | | | GB | 1470331 A | 14-04-1977 |
| | | | JP | 50030150 A | 26-03-1975 |
| | | | NL | 7404497 A | 15-10-1974 |
| | | | SE | 408065 B | 14-05-1979 |
| | | | US | 3968739 A | 13-07-1976 |
| WO 8901522 | A | 23-02-1989 | AT | 133203 T | 15-02-1996 |
| | | | AU | 2260688 A | 09-03-1989 |
| | | | DE | 3854918 D | 29-02-1996 |
| | | | EP | 0330686 A | 06-09-1989 |
| | | | US | 5559031 A | 24-09-1996 |
| | | | US | 5545543 A | 13-08-1996 |